# Proposed title of symposia

# Innovative Rehabilitation technologies for the home

**Organisers and Presenters**

Ann-Marie Hughes and Chris Freeman, University of Southampton (UK)

Claire Meagher and Sebastien Pollet, University of Southampton (UK)

Carolee Winstein, University of Southern California (USA), Philip Requejo, Rancho Los Amigos National Rehabilitation Center (USA).

**Discussion of symposia content**

This symposia will focus attention on the gap between technologies used in the lab and those used in the home. It addresses the question ‘how do we design technologies that will be used in home based practice for different types of impairments?’ Technologies are increasingly sophisticated and have many applications in supporting neuro-rehabilitation. Recent evidence from neurophysiological research and clinical studies has influenced rehabilitation interventions for the arm, providing valuable knowledge about how to apply technology-based therapy for people with neurological disorders, such as stroke and multiple sclerosis. However, home based use of such technologies remains limited. Do technologies need to be re-invented? The symposia will present some examples of novel home-based technologies, how they are underpinned by current understanding of neuroplasticity, users’ needs and expectations.

**Program Overview**

1. **Ann-Marie Hughes and Chris Freeman: Home based rehabilitation using iterative learning control (ILC) mediated functional electrical stimulation (FES)**

This talk will consider the broad issues surrounding the benefits of home-based technologies for rehabilitation. It will explain how these were considered in the development of a functional electrical stimulation system, briefly describing the neurophysiological basis for the intervention, the technology (data gloves, FES array and stimulator), user preferences and task based training. The talk will cover the results from the system, as well as the challenges to be considered when implementing such a system.

1. **Claire Meagher and Sebastien Pollet: Design and use of LifeCIT**

This talk will consider briefly the evidence for, and the barriers to, the translation of Constraint Induced Movement Therapy (CIMT) into clinical practice. LifeCIT was developed to address these barriers using an interactive website designed to guide stroke patients to carry out a home-based programme of CIMT. LifeCIT was developed using the input of subacute and chronic patients, allowing immediate modification and re-testing of intervention components as potential improvements were identified, relating to motivational aspects and usability. The talk will cover results of a randomised controlled, single blinded pilot study of the feasibility, acceptability and clinical effectiveness of LifeCIT.

1. **Carolee Winstein and Philip Requejo: Rehabilitation Engineering Research Center**

This talk will consider the recent proliferation of eHealth tecnologies which offers opportunities for development of low-cost, simple, interactive media prevention, health maintenance and sustained functional recovery programs using a chronic care model designed to promote engagement and participation. With two examples – long-term disability consequential to 1) hip fracture and 2) manual wheelchair use in those with spinal cord injury– we outline the developing science for a collaborative and transformative nexus team capable of accelerating an understanding of ways to restore independence and improve quality of life in the long-term. We conclude with a set of recommendations for the design of interactive media systems to both increase aceptability and stimulate research.

**Target Audience**

The intended audience is primarily therapists, researchers, medical practitioners involved in the application of arm rehabilitation technologies for neurological patients. The session will also be of interest to developers of new technologies as well as to any people interested in this field of study from a professional or personal background.

**Key Learning Objectives**

1. Understand the benefits of home-based rehabilitation technologies
2. Gain an awareness of technologies designed for the home environment
3. Understand the challenges involved in home-based rehabilitation using technologies

**Time Plan**

We propose that each talk will be 20 minutes followed by 5 minutes for questions. This will allow 15 minutes at the end of the symposium for discussion.

**Biographies**

**Chris Freeman** is a lecturer in applied control, School of Electronics and Computer Science, University of Southampton, U.K. He has a B.Sc in mathematical sciences, a B.Eng. in electromechanical engineering and a PhD in control systems. His research interests are in biomechanics, system identification, motor learning and control, iterative learning, and repetitive control theory and their experimental application to industrial systems and stroke rehabilitation.

**Ann-Marie Hughes** is a senior research fellow in the University of Southampton. She has an MSc in Information Systems and a PhD in stroke rehabilitation using technology. Her research interests are robotics, electrical stimulation, CIMT, and non invasive brain stimulation for stroke rehabilitation.

**Claire Meagher** has a BSc in Psychology and an MSc in Physiotherapy. She is currently undertaking a PhD in stroke rehabilitation and working as a Research fellow at the University of Southampton, UK. Her main research interests include CIMT, home based stroke rehabilitation and technologies for upper limb rehabilitation including activity monitoring using accelerometry.

**Sebastien Pollet** first completed a B.Sc. in Computer and subsequently obtained a B.Sc. in Occupational Therapy. He has worked as an Occupational Therapist in various patient settings and currently works as a Research Fellow at the University of Southampton in the United Kingdom.

**Phil Requejo** is a biomedical engineer who directs the Rehabilitation Engineering Center at Rancho and the Co-Director of the Rehabilitation Engineering Research Center on Aging.

**Carolee Winstein** PhD, PT, FAPTA is professor of Biokinesiology and Physical Therapy and directs the Motor Behavior and Neurorehabilitation Laboratory, University of Southern California, Los Angeles, CA, USA. She holds a joint appointment in the Department of Neurology, USC Keck School of Medicine. She is best known for work concerned with the functional neural and behavioral basis of motor control and learning and its relationship to neurorehabilitation.